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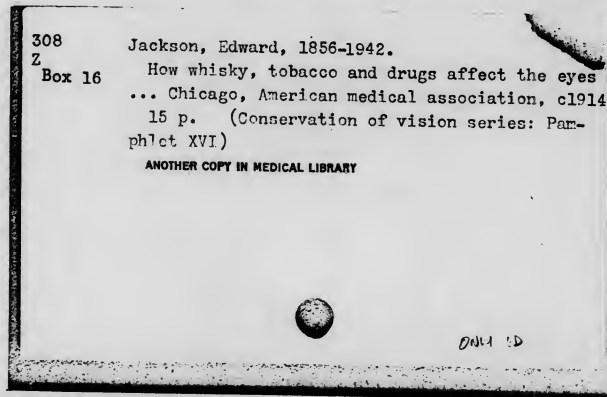
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HOW WHISKY, TOBACCO AND DRUGS AFFECT THE EYES

EDWARD JACKSON, M.D.
DENVER

CONSERVATION OF VISION SERIES PAMPHLET XVI

Prepared by the Committee on Conservation of Vision

Issued by the Council on Health and Public Instruction of
the American Medical Association

"In the health of the people lies the wealth of the nation."
—Gladstone.

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HOW WHISKY, TOBACCO AND DRUGS AFFECT THE EYES

EDWARD JACKSON, M.D.

DENVER

HOW POISONS ACT

To understand how the sight is impaired by whisky, tobacco and certain chemical compounds, one should know something of how poisons act. Most poisons select certain parts of the body, and exert their harmful effects chiefly or wholly on these; while other parts of the body are little or not at all affected. One drug will disturb the action of the heart, while the breathing is not affected. Another will cause the sweat glands to pour forth profuse perspiration, while the glands concerned in digestion are not at all disturbed. So one poison will injure one part of the eye, another will be felt in another part, or in the optic nerve.

Another peculiar thing about poisons is that they affect some persons much more than others. "What is one man's meat is another man's poison," is an old observation. A dose of a certain poison that will kill one person will leave another unharmed. So the eye of one person will be permanently damaged by an amount of poison that is not felt by another. Some people are extremely sensitive to certain poisons, so that a dose that most others will not feel at all may be dangerous to them. This is called having an "idiosyncrasy" to that substance. Again, the same person may be at one time quite able to withstand a certain dose of a poison, and at another time be seriously affected by a much smaller dose. Substances necessary to life become poisons when taken in excessively large amount; and the most dangerous poisons are harmless, or serve as medicines, when the dose is sufficiently reduced.

Some poisons act severely when taken in large dose, but when taken in repeated smaller doses have no injuri-

ous action or produce some quite different effect. For some things the repetition of the dose makes it less and less dangerous. Others only produce their injurious effects when taken for a long time in amounts that were at first not at all felt. These great differences in the action of different substances make it necessary to consider separately the effects that each of them produces on the sight.

SUBSTANCES IN COMMON USE

Tobacco.—One of the most striking and characteristic forms of blindness caused by poisoning is that due to the use of tobacco. So many persons use tobacco whose sight is not affected by it that it was formerly questioned if this could be the cause of blindness. In some countries, as Turkey and Spain, where tobacco has been used extensively, this form of blindness is scarcely met with, so that the power of certain races to resist the poison, or some difference in the kind of tobacco used or in the manner of using it, has been supposed to influence its effects. But among the people of North America it is not rare to meet with great impairment of sight unquestionably due to tobacco. This is much more common among men than among women, because of the more general use of tobacco by men; but occasionally women have suffered from it. It generally affects smokers, because most of those who use tobacco smoke. But occasionally one who has only used tobacco by chewing or taking snuff, or has been exposed to it by working with it, as in cigar-making, has developed this condition.

This form of poisoning is one that occurs only after long, habitual exposure to the influence of the poison. Many men are familiar from personal experience with the first poisonous effects of the use of tobacco. The nausea and vomiting caused by a first smoke soon pass away; and on repetition of the smoking they become less, and soon disappear entirely. So far as these effects are concerned, a "tolerance" for tobacco has been established. It is often supposed that tobacco no longer is injurious to that person. But other disturbances even more serious, and liable to be permanent, develop only after the narcotic has been used for long periods. Among these is the partial blindness that it causes.

The patient's age has an important influence in causing such blindness. The great majority of cases occur

in men over forty years old. They may have smoked or used tobacco from boyhood and never have had the sight affected by it. They may not at the time be using any more than they have used for years; or may even have reduced the amount as much as one-half before the trouble with seeing begins. Apparently, with age the power of the optic nerve to resist the poison becomes less. This has been ascribed to the well-known influence of tobacco in causing increased blood-pressure. But such a connection is not certain.

Influences that lower the general health often seem to bring on the trouble with sight. It may appear suddenly after a mental shock, or a period of severe nerve-strain, or loss of sleep, or serious trouble with the digestion. When this failure of vision occurs before the age of 40, the general health has mostly been impaired, either by very excessive use of tobacco, or alcoholic stimulants, or by other excesses.

The first thing noticed by a sufferer from tobacco amblyopia is the appearance of a cloud before his eyes, just in the direction he is trying to look. Whenever he looks at a thing this cloud gets in the way. Almost always both eyes are affected, although one may be a little worse than the other. The trouble varies from time to time. The cloud sometimes seems very light and at times so dense that nothing can be seen through it. But on the whole it gradually gets worse and more constant.

From the very beginning the recognition of colors is interfered with, in the affected space. If a large area of color is looked at, like a piece of cloth, a tree, or even a rose held close to the eye, the color may be easily recognized; although a small spot on the colored surface, just where the eye is looking, may appear dull or dirty. When, however, there is only a small point of color, as a flower looked at from a distance, the color cannot be recognized.

This defect of vision is extremely dangerous in those who have to recognize color signals, as engineers, firemen, pilots or sailors on lookout. The engineer or sailor may still be able to perceive a signal light at night. But, seeing no color in it, he will think it is a white light dulled by smoke or fog, or farther away than it really is. Such a person is all the more dangerous because he knows he has always been able to recognize colors, and

still recognizes them perfectly when seen in larger surfaces. The power to recognize the signal colors, red and green, may be quite lost before the man realizes that there is anything serious the matter with his sight. This loss of ability to perceive colors might come on in a few days after the eyes had been tested and the vision for colors found perfect. It has doubtless caused some of the accidents due to failure to obey color signals.

Even after such an accident a man might be tested and judged to see colors perfectly if the test did not include looking at a small point of color, like a signal light. It is in this early stage, when color vision is interfered with, but the patient can still read ordinary type, that tobacco amblyopia is especially dangerous. Safety can only be secured by having each person who has to be guided by color signals understand the danger, and be on the outlook for such an impairment of his color vision whenever his sight seems to be slightly disturbed.

If the disturbance of sight is neglected, and its cause not removed, tobacco amblyopia becomes gradually worse. The impairment of vision is more constant, the spot grows larger, the cloud more and more dense. The patient can no longer read even large print. When looked directly at even the largest letter is not seen; and as both eyes are affected, the patient is quite disabled for most occupations. Towards the edge of his field of vision objects may still be seen as clearly as ever. But this kind of seeing is of very little value as a means of working. It may enable the possessor to go about alone and to notice quickly any object coming on him from the side. But for purposes of gaining a livelihood, he is practically blind.

When the optic nerve of such a person is looked at, a certain part of it is seen to be unduly pale. If examined with the microscope after death, it will be found that a certain part of the nerve is completely atrophied, that is, the nerve fibers that carried the sight impulse to the brain have disappeared and been replaced by scar tissue. It is this tendency to affect certain fibers of the optic nerve, while leaving others quite healthy, that is the special characteristic of the poisonous effect of tobacco on the sight.

Prevention.—To avoid blindness from tobacco the first and most important thing is to keep it from entering the system. Many persons can use it, some through-

out life, without suffering from tobacco amblyopia. Some cannot; and these must avoid it. Many who have used it without apparent harm in early life cannot safely continue it, or must diminish the amount they use, when they pass middle age. For those who have already begun to notice the disturbance of their sight, the chance of regaining good vision, or even of its not becoming progressively worse, depends principally on giving up the use of tobacco completely, and at once.

Where the sight has been decidedly affected medical treatment may do much to restore it, if commenced soon enough and persisted in. But it is likely to be of very little benefit unless the use of tobacco is stopped. Other influences that are harmful to the optic nerve must also be avoided; such as the use of alcohol, or excessive nerve-strain from business cares or social indulgences. In many cases strict regulation of diet, and outdoor occupations are necessary to bring about the best result.

For those who use tobacco, but have never felt its harmful effects on vision, moderation is on the side of safety; and especially care to diminish the amount used after the age of forty. Mild tobaccos containing little nicotine are probably less dangerous. The same is true of methods of smoking that cause the least absorption of nicotine, as throwing away the cigar or cigarette before it is smoked to the end. Inhaling the smoke is bad. It is also more dangerous to smoke when the stomach is empty, and absorption likely to be more rapid. As to the amount that can be used without danger of causing amblyopia, no exact rule can be laid down. Among 349 cases observed at the Budapest Eye Clinic, there were very few of the patients who had not used as much as 25 grammes daily, containing about one gramme of nicotine. This would amount to about six ounces of tobacco a week. Other authorities have found that four ounces per week is as much as most persons can use safely; while as little as one ounce a week has caused amblyopia. If we count six cigars to the ounce, about the average, it is clear that three or four cigars a day is the limit of safety for most men; and for a few even this may be very likely to cause loss of sight. If the eyes have once been affected in this way by tobacco, and the disease has been checked and sight recovered more or less completely, the warning should be heeded, the only safe way being to give up entirely the use of tobacco.

Alcohol.—There is a whole series of chemical compounds that are called alcohols. The one drunk in whisky, brandy, wine, beer, hard cider, etc., which is commonly meant when simply the word alcohol is used, is grain or *ethyl alcohol*. Another of the series, methyl alcohol or wood alcohol, is also important as a cause of blindness. But the effects are so different from those of grain alcohol, that it must be considered separately.

Speaking then of ordinary ethyl alcohol, its more serious and permanent effects are produced only by its habitual use for long periods. A single indulgence in drinking alcoholic liquors of any kind may produce double vision, or uncertainty of the position of things seen. This is not from the direct effect of alcohol on the eye, but its effect on the nerve centers that control the muscles that move the eyes. These are disturbed in the same way as the nerves and muscles that have to do with standing or walking. The unsteady movements of the eyes cause uncertainty as to where they are turned, or cause the eyes to turn in different directions, so that double vision results. This passes off with the acute intoxication; but is likely to recur temporarily whenever sufficient alcohol is taken. Some persons are more liable to it than others, as one man cannot walk straight after a single drink, while another is able to keep his equilibrium after taking a much larger amount of alcohol. Occasionally a single large dose of alcohol has been followed by temporary loss of sight, but in these instances the blindness has not often been due to the poisoning by alcohol, but usually to some accident that has occurred in consequence, or something that was taken with the alcohol.

True alcohol amblyopia very closely resembles that caused by tobacco. In the great majority of cases both narcotics act together to cause the injury to the sight. Some think that alcohol is the most important cause; but more cases of weak sight have been observed where tobacco alone was used than where alcohol alone was used. When alcohol is the cause, the sight is liable to be affected rather earlier in life, although but few cases are met with before the age of thirty-five. As with tobacco, men suffer more frequently than women; but only because they more generally expose themselves to this form of poisoning.

As with tobacco the loss of sight begins with a cloud obscuring the object looked at, and vision for colors is

lost early. With alcohol, however, there seems more tendency for the cloud to spread to all parts of the field of vision, and for the blindness to be more generally permanent. This may be due to the fact that the general health of the sufferer is more seriously undermined by alcoholic indulgence; and it is more difficult to induce him to abstain completely and permanently.

Prevention.—Prevention of blindness in alcohol poisoning, like prevention of tobacco amblyopia, depends almost wholly on removal of the cause, or the causes, for in most cases both tobacco and alcohol are working together to produce the result. If the use of both be given up before actual disturbance of vision occurs, the danger is entirely removed. If complete abstinence is begun as soon as the clouding of the sight is noticeable, complete recovery will probably occur without any other treatment. But abstinence must be permanent, for when the point of injury to the sight has once been reached, a slight indulgence is likely to bring renewal of the disease, after which abstinence is less certain to prove effective. In most cases of alcohol amblyopia, however, medical treatment to eliminate the poison, and bring up the general physical condition to aid in recovery is very important; and generally every assistance, both medical and moral, is required to maintain the necessary avoidance of the cause.

Methyl Alcohol, the so-called *wood alcohol*, acts very differently from ordinary grain alcohol. Blindness is usually caused by it after a single debauch, in which some mixture containing methyl alcohol has been drunk to the point of insensibility, although the same results may be produced by prolonged exposure to smaller quantities of the poison. It has been said that if ten men drink wood alcohol to insensibility, four will become blind and die, and two will recover, but become permanently blind. The usual course of events is, that after drinking wood alcohol the patient suffers next day from severe nausea and vomiting, often with diarrhea. This may continue for a day or two, during which time vision rapidly declines, or after a few hours' sleep the patient awakes completely blind. Within two days or two weeks some sight returns, and it improves for two or three weeks. Often the patient is again able to go about readily, or even to read. He naturally thinks he is getting well. But without any further poisoning the sight

grows worse gradually, and continues to decline until practical or complete and permanent blindness ensues.

The above has been the more common history of blindness from wood alcohol. But it may come on more gradually, and even without drinking excesses of any kind. Some of the first cases of it occurred where the use of alcoholic drinks was prohibited. Essence of Jamaica ginger was bought and drunk in large quantities, or habitually, and this essence having been made with wood alcohol, produced its disastrous effects. In some cases the blindness has been produced by inhaling the fumes. A man engaged in varnishing the inside of beer vats, using shellac dissolved in methyl alcohol, and thus exposed many hours to the concentrated fumes, developed methyl alcohol poisoning, and lost his sight. Cases have arisen from varnishing furniture in a closed room, or from varnishing the inside of a closet. In a poorly ventilated pencil factory, where shellac dissolved in wood alcohol was used for varnishing the pencils, on bad days when the windows were not open the workers suffered, after two or three hours, from headache, dizziness, nausea and blurred vision. This generally passed off after a half-hour in the open air, but two of the girls suffered from permanent impairment of vision. In some cases the bad effects of the methyl alcohol have been increased by using it to cleanse the hands, or by getting it on the hands in cleansing the clothing.

In methyl alcohol poisoning, the whole field of vision is liable to be obscured; but often in the early stages, the point directly looked at seems most affected. Later this may clear up; and the field of vision contract so that nothing is perceived, except at or near the point looked at. Perception of colors is always greatly interfered with. But vision is so greatly damaged in other respects, that this is scarcely a source of danger.

Prevention.—After drinking wood alcohol, permanent blindness will generally come on in spite of anything that can be done. From one drinking bout, 130 were taken to a Berlin hospital, where 58 died, and the others remained more or less completely blind. In nearly all cases the victims supposed they were using ordinary alcohol, which is not so immediately disastrous in its effects. Prevention must come through education as to the extremely dangerous character of the poison; and

legal measures requiring it to be labeled for what it is, and to indicate the danger of poisoning by it. Methyl alcohol is widely used for burning, making varnishes and many other applications in the arts. It is cheaper than grain alcohol, enormously cheaper where, as in this country, grain alcohol is the subject of a heavy tax. There is a constant temptation to substitute the more dangerous poison where it will seem to serve the purpose equally or nearly as well. This has been done in the making of flavoring extracts, which are supposed to be taken only in small quantity; or in making varnish, or for cleansing.

Formerly, methyl alcohol was generally contaminated with substances which made it extremely disagreeable in taste and odor, so that it could scarcely be taken for ethyl alcohol. But with improved processes of manufacture, this is entirely overcome; and it has been put on the market under names that do not reveal its true nature, making it doubly dangerous. Because of this, legal enactments are required to prevent its sale in such a way as to permit concealment of its true character; and to compel a notice on each bottle of the danger of taking it into the system. This must constitute an essential step in the prevention of methyl alcohol blindness. When, however, the poison has found an entrance into the system in sufficient quantity to produce noticeable effects, medical aid to secure prompt elimination, and to combat its effects, should be sought at the earliest moment. A few cases of such blindness have recovered, but they have all come under medical treatment very early. On this account it is important to recognize at once the cause of the loss of sight.

Injury to the sight has resulted from burning methyl alcohol in a closed room. It is uncertain whether this was due to vapor of the methyl alcohol, or to formaldehyd, which is formed by its combustion. However this may be, care to avoid exposure to such fumes will prevent injury to sight.

Tea, Coffee, Chocolate, and Foods.—It is well known that these common beverages each contains a substance capable of powerfully affecting the functions of the body, when given in doses materially larger than are contained in the amounts commonly taken. In rare cases, the excessive use of either of these substances has caused a partial blindness. Thus a man accustomed to drinking

twelve cups of strong tea daily, had his vision reduced to one-twentieth of the normal. When the tea was stopped, vision improved to two-thirds of normal in about four months. A boy eight years old, who took six or eight cups of strong coffee daily, was found to see less than one-fifth of his normal vision. The coffee was stopped and in eight days his sight had improved to three-fourths of his full vision, which was regained later. A man found that every time he ate chocolate he suffered from an attack of the "dazzles" or ophthalmic migraine. Such cases are examples of rare idiosyncrasy; but being very unusual, the cause of impairment of sight is all the more likely to be overlooked. The discovery and removal of the cause is the one thing necessary to prevent blindness.

Occasionally certain articles of food cause symptoms of poisoning with disturbance of vision, which depend on disturbance of the movements, or the focusing power of the eye. Vision is recovered as the general symptoms of poisoning are relieved.

MEDICINES THAT MAY INJURE THE SIGHT

Quinin.—Of medicinal drugs, which are capable of causing blindness, quinin is the most important. In malarial districts, people become accustomed to taking it in very large doses. It is also taken with whisky or afterward, to neutralize the effects of the drinking. Blindness due to quinin begins after the more common symptoms of quinin poisoning have been noticed, ringing in the ears, partial deafness, fullness and aching in the head, dizziness, staggering, and even delirium and stupor. It may come on gradually in the course of a few days, or in a few hours, or even quite suddenly. It may amount to only a moderate blurring of vision, but is apt to be absolute—the most complete blindness from which there is any chance of recovery. The brightest light may be entirely unnoticed, although there are usually sensations of flashes of light.

This absolute blindness may last for days, even weeks. But after a time, some sight slowly returns. At first a bright light can be dimly seen when the eyes are turned directly toward it. Slowly this becomes clearer, and other objects can be dimly seen when the eyes are turned directly toward them. But the eyes may remain quite blind for things situated aside from the point looked at.

In other words, the field of vision is likely to remain narrow, even though the vision may become perfect at the point on which attention is fixed. The patient sees things as though looking through a tube, like a piece of stovepipe; a condition that unfits him for most kinds of useful labor. Nearly always both eyes are affected, at first equally. Later one may recover more sight than the other. In the severe cases there is usually some permanent damage to sight.

Prevention of quinin blindness consists in avoiding excessive doses of the drug. As much as an ounce has been taken at a dose without causing blindness. But half that amount would be very likely to cause blindness. Even quantities as small as 15 grains have, in rare cases, caused some disturbance of vision. Quinin is usually taken in repeated small doses. When this is being done the symptoms of quinin poisoning should be looked for, and when they become more severe, no more should be taken. If quinin blindness arises, medical treatment should be resorted to promptly, and can be expected to restore a large part of the vision. When a person has once suffered from quinin blindness and has recovered, there remains an unusual susceptibility to the drug, so that very moderate doses may bring on a new attack. Such persons must ever afterward use quinin with the greatest caution.

Salicylic Acid is sometimes taken in very large doses for rheumatism. It has, in a few cases, caused temporary disturbance of vision, very closely resembling that caused by quinin, but much less severe. No permanent damage has been observed, and generally recovery was complete within twenty-four hours. The other symptoms produced by salicylic acid, ringing in the ears, dizziness and disturbance, also closely resemble those caused by quinin.

Drugs That Dilate the Pupil.—The best known of these is "belladonna," including all preparations of the plant, *atropa belladonna*. Others are alkaloids obtained from it; atropin and homatropin, and from other plants of the same family, as *datura stramonium*, the Jamestown weed or "Jimson weed," and daturin from it; hyoscyamus and its alkaloids, hyoscyamin and hyoscin, also duboisin and scopolamin, similar alkaloids obtained from other members of the same botanical family. These substances all dilate the pupil and paralyze the focusing

power of the eye for the time being, and thus make the sight imperfect. The eye is extremely sensitive to their influence. The one-millionth part of a grain of atropin placed in the eye will perceptibly enlarge the pupil. In larger dose its effect may not wholly pass off for two or three weeks.

It sometimes happens that the pupil is dilated and the sight somewhat disturbed from the atropin that reaches the eye when quite small doses are taken into the stomach as medicine, or when a belladonna plaster is worn on the back. This should be borne in mind when medicine is taken internally, and especial care exercised to avoid reading or other close looking that might strain the weakened focusing power. It is sometimes supposed that these drugs have weakened the sight permanently. But no carefully observed case of the kind has been recorded, except where the eye has been previously diseased, in a way that would be aggravated by the use of the drug. When the influence of belladonna, or something of the kind, passes off, the eye returns to its original condition, or generally is somewhat the better for the enforced rest.

Another drug which dilates the pupil, cocaine, also prevents the eye from feeling irritation when the surface becomes dried, and the drying of the surface temporarily blurs vision. The effects of cocaine, however, all pass off in a few hours. The temporary effects on the sight of some other drugs, as digitalis and aconite, may also be explained by the changes they produce in the pupil.

Drugs that contract the pupil strongly, as eserine, pilocarpin and muscarin (the latter found in toad-stools and putrid fish) may cause dimness of vision, especially at a distance, through cramp of the focusing muscle of the eye. This effect passes off in a very few hours. In a very few cases morphin and heroin have injured the sight.

Male Fern.—Preparations of the root of male fern (*aspidium filix mas*) are quite popular as worm medicines. When one dose has failed to give permanent and complete relief, a second larger dose is taken, and this is sometimes continued until the desired result has been secured. This drug is, however, capable of causing severe poisoning and blindness. Usually the blindness comes on after several hours, or a day or two of severe

sickness and vomiting. Sight is lost quite rapidly and in many cases the blindness has been permanent. Such a medicine should be taken only under skilled direction, and if symptoms of poisoning arise, medical assistance should be promptly obtained.

Santonin, another popular worm poison, and the basis of many secret proprietary worm medicines, may also injure the sight. In most cases it has only caused everything to appear a deep yellow tint, as though seen through yellow glass. But in a few cases it has caused complete permanent blindness.

Iodoform, a drug used on raw surfaces, and to control the formation of pus, has sometimes caused poisoning and disturbance of vision. Such effects have only been produced when it was used on a large surface, and for a long time. The disturbance of sight resembles that of tobacco amblyopia. It comes on gradually after other symptoms of iodoform poisoning, such as fever, diarrhea, headache and delirium, have occurred. Removing the cause by stopping the use of iodoform, is generally followed by recovery.

Naphthalene, or *naphthalin* (tar camphor) has long been known to cause cataract when fed to the lower animals. In a few cases where very large amounts have been taken, it has caused partial cataract in men, *Potassium chlorate*, when taken in very large doses, or used in excess as a gargle, has caused poisoning with impaired sight.

POISONS USED IN THE ARTS

Lead.—Lead is a poison which may gain access to the system in many ways. Commonly these are associated with the occupations pursued, or some special feature in the daily life of the individual. Painters working with lead paint are especially subject to lead poisoning. The wife of a painter, washing each week two pairs of her husband's overalls, became thus affected. Printers handling type suffer from it. Lead in hair dyes has caused it. Tailors and seamstresses, who bite the thread which has been "weighted" with sugar of lead, have been affected. Miners of lead, those who glaze pottery, and workers in lead factories of various kinds, often suffer. Children playing where they handle lead paint, disintegrated by exposure to the weather, especially if they bite their nails or suck their fingers, are

l'able to take enough lead into the system to cause blindness.

In most cases the disturbances of vision do not appear until the person has suffered from repeated attacks of lead cramps, colic, constipation, palsy, anemia, and emaciation. But sometimes, especially in children, the loss of sight may be the first symptom, and only very careful observation will show the cause of the trouble. Commonly there is a general haziness of vision, which may rapidly increase to complete blindness. Sometimes the blindness is quite sudden; and from such blindness, recovery is usually rapid and often complete. But in the larger number of cases it comes on gradually, the field of vision is contracted and the damage to sight permanent. Prompt recognition of the cause and of the source from which the lead enters the body, with removal of its influence and active medical treatment to remove lead from the system, will generally secure a permanent restoration of vision.

Prevention.—All whose occupations compel them to come in contact with lead, should bear in mind the dangers of lead poisoning and consequent loss of sight. Hair dyes, face powders, etc., containing lead should be strictly prohibited. Articles of food containing acids that can dissolve lead should be kept from contact with it. Even the glazing of earthenware may become a source of supply of the poison. Paint containing lead should not be used for places where the hands of children will come in contact with it, especially if it is exposed to the weather, as window sills or porch railings. Those who necessarily come in contact with lead should be careful to cleanse the hands of it on quitting work, and to secure its elimination from the body.

Arsenic is extensively used in the arts, and may be absorbed from wall-paper, insect powder, contaminated anilin dyes, etc., in sufficient quantities to cause symptoms of poisoning, including blindness. The loss of vision generally follows other symptoms of poisoning, as disturbance of the stomach and bowels, irritation of the skin, or inflammation of the nerves and paralysis. The sight is slowly lost with contraction of the field of vision, so that objects can be seen only in a very small space. The progress of such blindness may be checked by finding how arsenic is getting into the system, and

stopping it. But the sight lost is not likely to be regained.

Of late years, certain medicines containing large quantities of arsenic, especially atoxyl, which is given very freely as a last resort for sleeping sickness, have caused blindness, which comes on more rapidly. When it was recognized that this caused blindness, and the arsenic was promptly stopped, the sight was sometimes recovered. But where, as sometimes seemed necessary to save life, the drug was continued after the sight got dim, complete and permanent blindness followed. In Professor Koch's investigation of the sleeping sickness in central Africa, of 1,000 treated with atoxyl, 22 became blind.

Nitrobenzol and Dinitrobenzol.—These drugs, used in making anilin dyes, as a scent, and entering into the composition of explosives, are capable of causing headache, weakness, blueness of the face, and impairment of vision. These symptoms arise among those who work in these substances, especially the grinding of the latter, which gives off dust. Vision diminishes gradually with contraction of the field of vision and failure of color perception. If the exposure to the poison ceases, as by giving up the work, the sight usually recovers within a few months. Care to prevent the contamination of the air by the dust and to avoid handling of the substances with the bare hands, will prevent this form of poisoning.

Carbon Bisulphid is used extensively in vulcanizing rubber. Exposure to the vapor of it causes symptoms of poisoning, including dizziness, irritability, excitement, muscular weakness, mental disturbances and impairment of vision. The disturbance of vision very closely resembles that caused by tobacco and alcohol. If the cause is removed, vision will recover, but not always completely.

Anilin absorbed by those working in it, or used in cosmetics or hair dyes, may cause headache, vertigo, and great disturbance of vision. After removal of the cause with appropriate medical treatment, all the reported cases have recovered.

Exposure to noxious gases, especially carbon monoxid, and those developed by the explosion of dynamite, may cause grave impairment of vision which may be permanent.

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